WATER REQUIREMENTS
FOR NORTH SANTA CLARA VALLEY

A Report Prepared by

SANTA CLARA VALLEY WATER CONSERVATION DISTRICT

15420 Almaden Road, San Jose, California

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WATER REQUIREMENTS

FOR NORTH SANTA CLARA VALLEY

I. TOTAL WATER USE

Water usage in Santa Clara Valley may be divided into three categories, the sum of which represents the area's total water requirements. These categories are herein referred to as: (1) municipal, (2) agricultural, and (3) industrial usage. Municipal usage refers here to the water distributed by both public and private water companies for any purpose, including residential, industrial, irrigated park, airfield, and institutional demand. Agricultural usage refers to all irrigation and farmstead demand. Industrial usage, category (3), refers to all industries, including canneries, which derive their water supply from private well installations. For the purposes of this paper, the investigation period includes the years 1948 through 2010.

Category (1), or municipal usage, has historically represented only a minor item of usage as compared with the total water requirements of the Valley. It can be noted that in 1948 this usage constituted only about 18% of the total. However, this has changed to nearly 43% at the present and is expected to continue to an estimated 85% in the year 2010. Conversely, category (2), or agricultural usage, represented approximately 77% of the total in 1948, changing to 49% at the present. In the year 2010 the agricultural use will be an estimated 6% of the total. Category (3), industrial usage, will probably be a rather stable usage in contrast to categories (1) and (2), in spite of the fact that many new industrial plants are anticipated for the future. The reason for this lies in the future of Santa Clara Valley's canning industry. It is expected that urbanization in this area will gradually strangle the agricultural production to a point that local canneries will be unprofitable, thereby providing them with a reason to locate in another area. Since the canning industry is a rather heavy user of local groundwater, its declining future use will tend to stabilize the otherwise rapidly increasing demand for industrial water.

Since municipal usage at present constitutes approximately 43% of the total demand, and will increase to an estimated 85% in the year 2010, it represents the most important category. In attempting to analyze this usage accurately, it was determined that the most feasible approach would be to obtain the service area needs of each city in Santa Clara Valley, rather than to make broad assumptions for the Valley as one unit. By this approach each city's water requirements could be determined on the basis of its own population and development characteristics. Therefore, in March, 1958, questionnaire letters were sent to all of the major public and private water companies in North Santa Clara Valley, requesting information on future water requirements and approximate locations for future supplemental water delivery points. Information obtained from letters of reply to this questionnaire, in addition to subsequent correspondence and consultation with the companies, formed the basis for municipal water requirements.

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A direct approach to the determination of agricultural demand, such as used above for municipal usage, is not possible due to the absence of detailed agricultural pumping records. Any attempt to tabulate past usage in this category on the basis of individual well installations, consisting of several thousand in number, would be impractical.

The State Water Resources Board in 1955[1] estimated that the average total use of water in 1948 had been 188,200 acre-feet per year. This value is accepted as a sufficiently accurate total to use in determining agricultural draft. Their distribution of use has been revised by utilizing the known urban use figures obtained from the various water agencies in the area.

Using this total demand of 188,200 acre-feet and subtracting from it the 1948 municipal use of 33,200 acre-feet and the 1948 industrial use of 14,000 acre-feet results in an average agricultural use in 1948 of 141,000 acre-feet per year.

This latter amount was independently checked in 1957 in a report to the Tri-County Water Authority[2] in which report the 1948 agricultural use was given as 143,000 acre-feet.

Agricultural use for 1960 is obtained by subtracting from the 1948 agricultural use the amount of water used by those lands which have changed from agricultural to other uses since 1948. From estimates of withdrawals from agricultural use prepared by the Santa Clara County Planning Department it is possible to predict future agricultural water requirements.

A third check on the agricultural use can be obtained by computing the pumping draft from the agricultural power sales. This method indicates somewhat lower values for agricultural use than those given above but are not too reliable because of the many assumptions that have to be made.

The third component of total water demand is category (3), industrial use. Those commercial and industrial plants which obtain their water requirements from a private or public water company are excluded from this usage, as they have been included in the municipal use. Due to the unavailability of actual consumption records, information obtained from the Perrott and Dunn Report[3] was used as a basis for estimating this usage. Information thus obtained revealed that industrial consumption amounted to approximately 14,000 acre-feet in 1948, changing to 20,000 acre-feet in 1960. This usage is expected to increase gradually to 25,000 acre-feet per year in 1980, and to continue at a similar increasing rate to the year 2010.

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[1] State Water Resources Board, State of California, Bulletin No. 7, "Santa Clara Valley Investigation," June 1955, Table 34, p 58.

[2] Santa Clara-Alameda-San Benito Water Authority, "Supplemental Water Requirements of Alameda, Santa Clara, San Benito Counties," March 1957, Appendix A, p A-3.

[3] Ibid., Appendix A, pp A-3, A-4.

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Although the agricultural water use of 141,000 acre-feet in 1948 is an estimated average value, its importance diminishes so rapidly that any error in this 1948 figure becomes insignificant by the year 1990.

On the other hand, the urban water use figures used are nearly 100% accurate for the historical period 1948-1960 and are as reliable as it is possible to have them for the future period of investigation.

As a result, it can be reasonably assumed that the total water requirements for North Santa Clara Valley for the period 1948-2010 are as accurate as it is possible for any estimate to be.

The numerical values used for plotting the curves on Plate I are included in Table II in the Appendix.

II. LOCAL DEVELOPMENT

With the total water requirements of North Santa Clara Valley determined, the next step in water importation requirements is to determine the amount of water locally available. This, of course, varies widely due to varying weather conditions.

The amount of water developed in any season from local sources is equal to the total use (as obtained from Plate I) minus the amount imported from outside sources, minus the amount derived from compaction of clay strata, plus the recharge or minus the overdraft on the underground supply.

The results of such a computation for the period 1951-59 are given in Table I.

It is assumed that this average value of 208,100 acre-feet per year will be decreased in the future by the decrease in direct rainfall and irrigation surplus water penetration to the underground supply. It is estimated that this decrease will amount to 30,000 acre-feet by 2010 so that at that time the amount of water locally developed will be only 178,100 acre-feet per year.

III. IMPORTATION REQUIREMENTS

From the results of the preceding two sections, the importation requirements of North Santa Clara Valley can be obtained.

Plate I and Table II indicate that the total use of water in the year 2010 will be 362,200 acre-feet per year. It was pointed out in Section II that the amount of locally developed water available at that time will average only 178,100 acre-feet per year. Thus it is evident that the water importation requirements at that time are the difference between these two amounts, or 184,100 acre-feet.

In order to determine how much of this imported water should be supplied on the surface and how much should be percolated into the underground, it was assumed that the City of Santa Clara and the Campbell

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Water Company would continue to obtain their entire supply from wells. Also, it is assumed that the agricultural and industrial use will be met entirely from wells. It was further assumed that the San Jose Water Works would obtain all of its future requirements from wells, except for its presently developed mountain sources, and those quantities of surplus water they require at Blossom Hill and Harwood Roads, Saratoga Avenue and Southern Pacific Railroad, Cox Avenue and Southern Pacific Railroad, and Bubb Road and Southern Pacific Railroad.

On this basis it will be necessary to percolate 103,500 acre-feet of the 184,100 acre-feet to be imported. The balance of 80,600 acre-feet will have to be supplied through a surface distribution system.

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APPENDIX

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Table I - Computation of Average Annual Development of Local Water Resources

Table II - Data for Water Demand Curves

Plate I - Annual Water Requirements, North Santa Clara Valley, Period 1948-2010

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TABLE I

COMPUTATION OF AVERAGE ANNUAL DEVELOPMENT OF LOCAL WATER RESOURCES

1951-1959

Year	Total Use	Water of Compaction & Importation	Change in W.L.	Recharge (+) or Overdraft (-)	Total from Local Sources
1951	189,000	17,000	+11.5	+ 73,000	245,000
1952	190,000	8,000	+13.6	+ 86,400	268,400
1953	191,000	12,000	- 0.5	- 3,200	175,800
1954	195,000	16,000	- 3.7	- 23,500	155,500
1955	198,000	19,000	- 6.6	- 41,900	137,100
1956	202,000	14,000	+11.1	+ 70,500	258,500
1957	206,000	19,000	- 6.2	- 39,400	147,600
1958	213,000	15,000	+17.2	+109,200	307,200
1959	220,000	24,000	- 2.8	- 17,800	178,200
Total			+33.6		1,873,300

Average local development per year = 208,100

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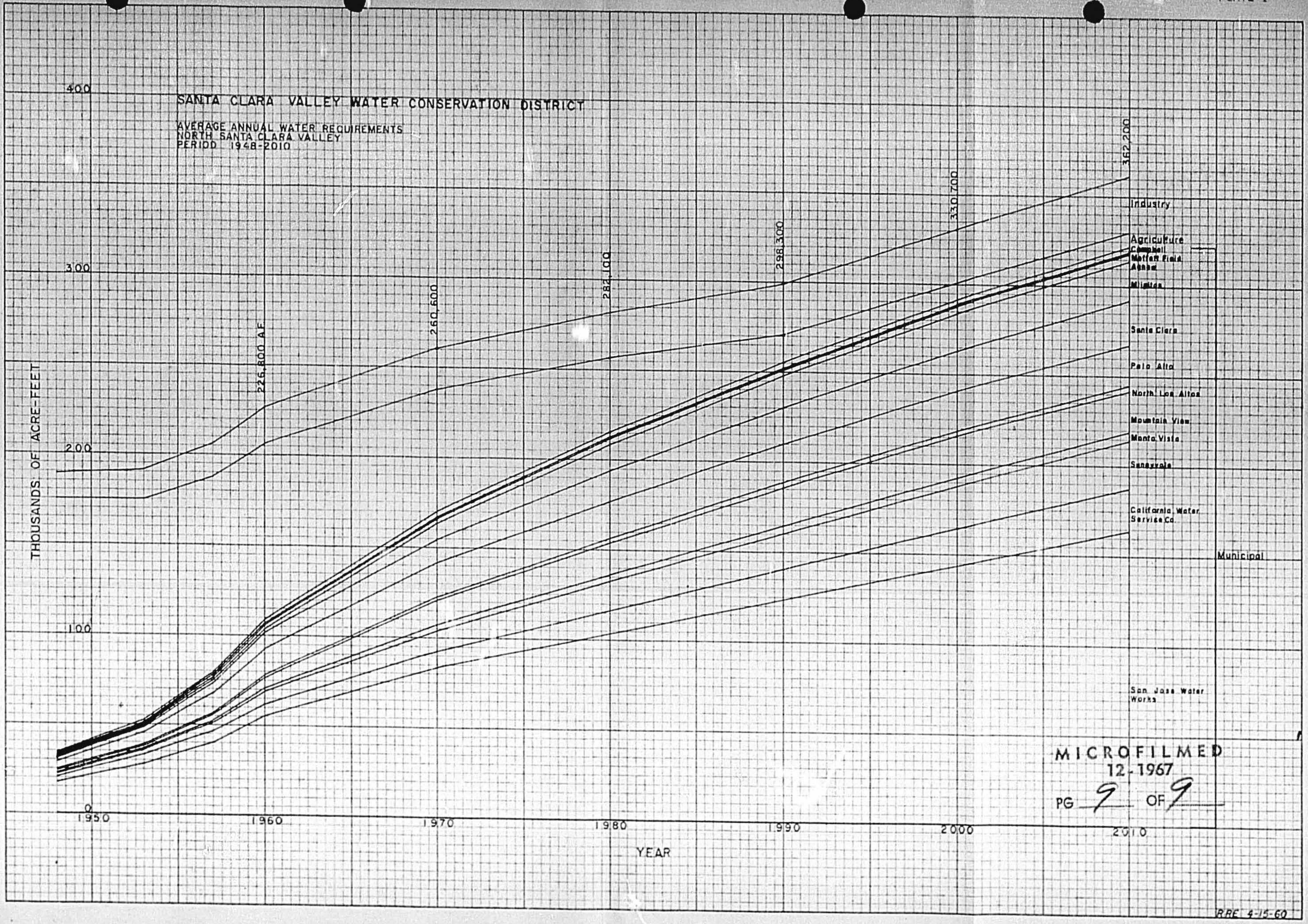
TABLE II

NORTH SANTA CLARA VALLEY WATER REQUIREMENTS (DEMAND CURVE DATA)

	Accumulated Demand in Acre-Feet								
User	1948	1953	1957	1960	1970	1980	1990	2000	2010
San Jose W.W.	17,600	28,000	40,000	55,000	83,500	103,500	123,500	143,500	163,500
+	3,200	5,600	6,000	7,000	9,200	13,000	16,900	21,000	24,000
Cal. Water Serv.	20,800	33,600	46,000	62,000	92,700	116,500	140,400	164,500	187,500
+	1,500	2,100	5,500	7,000	12,000	16,000	20,000	23,500	27,000
Sunnyvale	22,300	35,700	51,500	69,000	104,700	132,500	160,400	188,000	214,500
+	200	400	800	1,500	3,000	3,500	3,800	4,000	4,300
Monte Vista	22,500	36,100	52,300	70,500	107,700	136,000	164,200	192,000	218,800
+	1,000	1,900	3,700	6,300	13,000	18,000	22,000	24,000	24,000
Mountain View	23,500	38,000	56,000	76,800	120,700	154,000	186,200	216,000	242,800
+	800	800	800	1,500	1,700	1,800	1,900	1,900	2,000
North Los Altos	24,300	38,800	56,800	78,300	122,400	155,800	188,100	217,900	244,800
+	4,400	7,000	11,100	15,000	19,400	21,000	22,000	23,000	23,000
Palo Alto	28,700	45,800	67,900	93,300	141,800	176,800	210,100	240,900	267,800
+	2,100	2,900	6,000	9,000	13,000	17,000	20,000	23,000	25,000
Santa Clara	30,800	48,700	73,900	102,300	154,800	193,800	230,100	263,900	292,800
+	500	700	800	1,500	9,000	15,000	18,000	20,000	21,300
Milpitas	31,300	49,400	74,700	103,800	163,800	208,800	248,100	283,900	314,100
+	30	30	1,800	2,000	2,500	2,900	3,300	3,700	4,000
Agnew State Hosp.	31,300	49,400	76,500	105,800	166,300	211,700	251,400	287,600	318,100
+	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
Moffett Field	32,500	50,600	77,700	107,000	167,500	212,900	252,600	288,800	319,300
+	700	1,000	1,100	1,900	2,100	2,400	2,700	2,900	3,100
Campbell	33,200	51,600	78,800	108,900	169,600	215,300	255,300	291,700	322,400
+	141,000	122,800	108,300	97,400	68,200	41,600	15,400	8,900	7,200
Agriculture	174,200	174,400	187,100	206,300	237,800	256,900	270,700	300,600	329,600
+	14,000	16,500	18,500	20,000	22,500	25,000	27,500	30,000	32,500
Industry	188,200	190,900	205,600	226,300	260,300	281,900	298,200	330,600	362,100

PLATE I



SANTA CLARA VALLEY WATER CONSERVATION DISTRICT

AVERAGE ANNUAL WATER REQUIREMENTS
NORTH SANTA CLARA VALLEY
PERIOD 1948-2010

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